1. Introduction

Sustainability green manufacturing is and will be a crucial issue for the present and future next generations of manufacturing. The current assumption that natural resources are infinite and that the regenerative capacity of the environment is able to compensate for all human action is no longer acceptable. Hence, sustainability issues will influence all organisational aspects of the human life, from the economical, political, social and environmental points of view. The reason is simple: until now, all human activities have been based on the paradigm of unlimited resources and unlimited world's capacity for regeneration; from now on, the awareness of the termination of this assumption means that all related behavioural models must be changed (M Garetti and M Taisch, 2011).

Industrial globalization and demand for quality products, the manufacturing industries to improve the quality level of products as per the requirements of the customers. Manufacturing industries are match the customers need, quality requirements, manufacturing industries have been only focused on economical benefits. It has resulted in the consumption of large quantities of non-renewable resources along with the simultaneous generation of wastes and pollution (Cassettari et al., 2017). Golini and Gualandris (2018) according to research the positive relationship between globalization and sustainable innovation in manufacturing industries. Sustainable green manufacturing does not only achieve environmental protection but also adopts the processes that are beneficially for customers, employees, the environment as well as communities of the society. Song and Moon (2016) according to research the highlighted the positive correlation among sustainability and manufacturing sector.

As per the Department of Commerce in the US, Sustainable manufacturing is "the pattern of manufactured products which use processes that reduce harmful environmental and ecological impacts, save energy and natural resources, are secure for employees, communities, consumers and are economically sound" (Chan et al., 2017). The concept of Sustainable manufacturing but many hurdles require to be removed at the implementation stage (Xia et al., 2015). Sustainable manufacturing has emerged out as an intriguing concept which demands strategic attention from the business practitioners. To extend Sustainable manufacturing adoption throughout the business functions, it should be employed to products, processes, and services of the industry (Bilge et al., 2016).

Sustainable green manufacturing provides goods and services of primary importance for supporting the quality of the human life, also significantly contributing to the world economy. Sustainable green manufacturing is much more than production. In fact, Sustainable green manufacturing includes all industrial activities from the customer to the factory and back to the customer, thus including all the different kinds of services that are

connected to the manufacturing chain. Sustainable green Manufacturing can be distinguished within: discrete manufacturing, process industries, services and recycle. Sustainable green manufacturing can be defined as the ability to smartly use natural resources for manufacturing, by creating products and solutions that, thanks to new technology, regulatory measures and coherent social behaviours are able to gratify economical, financial, company image, environmental and social objectives, thus preserving the environment, while continuing to improve the quality of human life.

The majority of these review articles focus on the selection of various Sustainable manufacturing strategies and optimal technologies through recorded literature. It was also identified that most of the studies focus on a specific aspect or issue, such as simulation modeling, mathematical problems, ionic liquids, gears, direct metal additive manufacturing, sustainability definitions, sustainability assessment methods, sustainable indicators, sustainable product development techniques, operation research methods, stakeholder expectations, etc. These review articles enrich the understanding of Sustainable manufacturing in different perspectives but their intensify investigation suggests the limited focus to specific areas (J Malek and T N. Desai, 2020).

The main objective of the manufacturing industry is to maintain and strengthen them. Manufacturing industry strategies should adopt sustainability so that the benefits for industry and its image, financial stability, and also a social benefit. Manufacturing industries need to bring the stability amongst economical, ecological, environmental, and societal aspect for sustaining the market existence. Sustainable green Manufacturing is one of the present beneficial eras which can bring the stability amongst economical, ecological , environmental, financial and social aspects. A comprehensive review study needs to be carried out for a better understanding of sustainable green manufacturing.

Recent literature emphasizes the importance of sustainable manufacturing and many Industrial researchers discuss their applications. Determine everything the potential benefits of different sustainable manufacturing implementations are boring task, since most of the advantage does not derive from the sustainable manufacturing itself but among the many solutions that derive from sustainable manufacturing implementations. The integration of sustainable manufacturing can provide many benefits for the manufacturing industries, which are addressed in all this work. The article reviews the state of the art in the context of the sustainable manufacturing and introduces a framework proposal. Sums up the past studies on the subject through consolidation and critical examination, Contributions from previous surveys, start with a discussion of sustainable manufacturing literature to grasp the conceptual and theoretical state of research to identify gaps in knowledge in the literature, including the similarities and differences between the components of sustainable

manufacturing concept generalization and his relationship with the sustainable manufacturing.

As global consumers have become more aware of the environmental impacts and health risks Inherent to textile industry, the public along with nongovernmental organizations and global consumers have been putting pressure on the textile industry to produce environmentally and socially conscious products. For any manufacturing industry enabler and critical success factor play a key role for social, ecological and financial benefits.

1.1 Motivation behind the Present Research Work

Sustainable manufacturing is part of a larger concept, sustainable development, which emerged in the early 1980's in response to increased awareness and concern over the environmental impact of economic growth and global expansion of business and trade. Sustainability means meeting the needs of the present without compromising the ability of future generations to meet their own needs. The most important issue facing manufacturing sectors in India is the lack of awareness about environmental issues and waste disposal. Their adoption towards Sustainable manufacturing results in the greater benefits that will also affect environment, ecological, social, and financial and image.

The future for the Indian textiles industry looks promising, buoyed by strong domestic consumption as well as export demand. With consumerism and disposable income on the rise, the retail sector has experienced a rapid growth in the past decade with the entry of several international players like Marks & Spencer, Guess and Next into the Indian market.

This research is focused on the study of Sustainable manufacturing in textile industry issues and various aspects of its implementation. It can provide an important input to the textile industries in deciding the right path for effective Sustainable manufacturing implementation.

1.2 Benefits and challenges of Sustainable manufacturing

Whether small or large organizations, companies need consider developing a sustainable manufacturing capacity, a manufacturing industry will compete in globally. Finally, the sustainable manufacturing is the key to the growth and long term success of manufacturing industries. The textile industry is an extremely integrated global market where companies seek to balance high quality with low cost of production. The textile industry involves long and diverse supply chains with different production processes from across the globe. In the textile production significant environmental impacts which include wastewater emissions from dyeing, finishing, and washing processes, increase in pollution, solid waste production, and significant depletion of resources from consumption of water, fossil fuels, and raw materials.

Sustainable manufacturing concepts are examples of developments and the next generation of manufacturing that has arisen from these concerns. Sustainable manufacturing, on the other hand, could be the way to go Improve and achieve a better Sustainable manufacturing framework and strategies. The following sections examine the challenges and benefits of sustainable manufacturing (Neto et al. 2019).

1.3 Chapterization of synopsis

This synopsis is divided into six sections including introduction. Section two deals with review of literature on sustainable manufacturing. The objective of research are presented in section three. Section four presented the research methodology. Proposed research plan is presented in section five. Section six deals with conclusion of study.

2. Review of Literature on Sustainable Manufacturing

This review of journal articles and industrial reports is based on a classification methodology. It is addressed as a basis for the conceptual and the theoretical reference framework. The classification used in this literature review explained below-

2.1 Method of study

Relevant publications are found with the help of a detailed online search with the aim of collecting, organizing and synthesize existing sustainable manufacturing knowledge. The identified documents cover different types of interconnected disciplines including production engineering and industrial engineering. Using the research queries in online databases are today the dominant method of identification of the most relevant works. It is more practical to focus on online databases rather than review library collections for a review of the literature in the sustainable manufacturing. Therefore, the following major online databases were the goal: Elsevier's Scopus, Thomson Reuter's Web of Science, IEEE Explore, ProQuest (ABI / INFORM) and Science Direct (Elsevier). This research indicated that the sustainable manufacturing concept is still in its early years research and development among academics, while it is widely Recognized and discussed among professionals. To include industrial relations, the Google search engine is also used for more to reach (Buyukozkan and Gocer , 2018).

Table 1- Review of Literature on Sustainable Manufacturing

Sr. N.	Authors name	Jouranal Name	Title	Objective	Finding	Limitations
1	Früchtl et al. 2020	17th Global Conference on Sustainable Manufacturing 2020	Sustainable manufacturing towards sustainable life cycles A comprehensive and interdisciplinary perspective on sustainable manufacturing towards sustainable life cycles	This research paper focused on complexity reduction, while social sciences and psychology tend to increase it by coming up with even more impacting factors and dimensions.	To assess the entire sustainability footprint of a product, all impact factors within the product life cycle need to be taken into account and optimized globally – from resource mining to manufacturing, ICT utilization and transportation to the dealings at the end of product life	This research only focused on manufacturing process, system, products as separate entities of optimization.
2	Jia et al. 2020	Journal of Cleaner Production	Circular Economy in Textile and Apparel Industry: A systematic Literature review	This research paper focused on four themes—drivers, barriers, practices, and	This research paper establishes an integrated conceptual model. The framework shows the drivers, and ex-post	In this research lack of social factors in CE Measurements and

				indicators of sustainable performance when applying a circular economy in the textile and apparel industry.	barriers, circularity practices such as relationship building and dynamic supply chain execution, and performance measurement indicator.	methodology.
3	Singh et al. 2019	Measuring Business Excellence, emerald insight	Identification and evaluation of determinants of sustainable manufacturing: a case of Indian cement manufacturing	This paper aims to identify and examine the determinants for sustainable manufacturing in cement manufacturing industry in India	Findings from AHP provide the weightage to the all 13 indicators of sustainable manufacturing.	In this research the lack of data collection.
4	Anastasia et al. 2019	Journal of Manufacturing Systems	A Holistic approach to corporate sustainability assessment: Incorporating sustainable development goals into sustainable manufacturing performance evaluation	Corporate Sustainability Assessment in manufacturing is a framing of tools that lead the business and organization toward sustainable practices and indicate how the same business and organization contributes to a global Sustainable Development.	criteria for SM are developed based on the current state of the art	Lack of the existing baton schemes is insufficient for the purpose of providing all essential information about a system and its rate of change.
5	Chingu wa et al. 2019	16th Global Conference on Sustainable Manufacturing - Sustainable Manufacturing for Global	Feasibility study of the materials handling and development of a sustainable conveying system in plastics recycling and manufacture	This research focused on analysis and development of the optimal conveying system in the uninterrupted	This research fin out the improvement of safety, reduction in transportation and operational cost of the sustainable recycling and manufacture of plastic packaging.	In this research limit pollution and pilferage of materials being transferred tested on few weight of quantity, larger

		Circular Economy	Feasibility study of the materials handling and development of a sustainable conveying system in plastics recycling and manufacture	movements of materials.		quantity then result may be very as per research data.
6	Mathiyazhagan et al. (2019)	Opsearch	Challenges for implementing green concept in sustainable manufacturing: a systematic review	The article aims to identify most adopted sustainable manufacturing strategies for improving material performance and to compare these strategies against 17 different characteristics of SM strategies.	The authors identified that current investigations of decision support systems were more focused on the integration of sustainability in all three dimensions (economic, environmental, and social) at the strategic planning level (design and remanufacturing of products and processes) and less focused at the operational level (production planning and controlling). It was also identified that decision-making was mostly driven by single sustainable dimensions (environmental and economic)	In this research major obstacles not considered.
7	Neto et al. 2019	Journal of Cleaner Production	Cleaner Production in the textile industry and its relationship to	This research aims to evaluate if the economic and environmental	this research study allows decision-makers in the textile industry to adopt the approaches	This research not conducted in larger number of

			sustainable development goals	advantages coming from Cleaner Production adoption in the textile industry contributed to the Sustainable Development Goals.	presented here in to evaluate the resources to be allocated in process improvements and their financial and environmental impacts, as well as environmental strategies in relation to SDGs	companies and other industrial segments,
8	Muhammad Akbar and Takashi Irohara, 2018	Journal of Cleaner Production	Scheduling for sustainable manufacturing	This research has an main objective to get a comprehensive view of the state and progress of sustainable scheduling by considering more sustainable indicators to assist many manufacturers to apply environmentally sound technological solutions.	The results show that energy cost and greenhouse gas indicators become the most frequently used indicators in sustainable scheduling.	This research that keep the old sustainability indicators.
9	Cepture anu et al. 2018	sustainability	Impact of Competitive Capabilities on Sustainable Manufacturing Applications in Romanian SMEs from the Textile Industry	This research paper examines the impact of competitive capabilities on sustainable manufacturing practices in Romanian small and medium-sized enterprises from the textile industry.	This study introduces a model that extends our knowledge regarding the determinants of SMP in SMEs and their impact on dimensions of competitive capabilities.	In this research limitations in data collection and generalization.

10	Anupriya Desore and Sapna A. Narula, 2018	Environ Dev Sustain, Springer	An overview on corporate response towards sustainability issues in textile industry	This research main objective is managerial approaches being used for incorporating sustainability.	The paper has presented the motivations for textile firms to adopt environmental practices, the response of the firms in form of both process- and market-driven strategies and major drivers and barriers to implementation of these practices	These studies do not make use of advanced empirical examination and use of existing consumer behaviour models.
11	A Sethi 2018	Pacific Business Review International	Obstacles Faced by Small Medium Enterprises in Imparting Training: An Empirical Study on Textile Industry	This research paper focused on relevant constraints faced by SME's in conducting effective skill enhancement program.	This research paper result outcomes is manpower skill, scarcity of resources and training awareness which actually create obstacles for SME's.	This research only conducted in one state.
12	Anupriya Desore and Sapna A. Narula, 2018	Environ Dev Sustain, springer	An overview on corporate response towards sustainability issues in textile industry	This research paper study the drivers, barriers, and responses of firms in the textile industry in favour of sustainability	This research study their understanding of types of strategies to be adopted by firms and the drivers and barriers for implementation of environmental management at the firm level, thereby promoting sustainable consumption and production of textiles.	How to identify the comparison can be drawn between multinational companies and domestic firms with respect to motivations, strategic response and barriers across the supply chain to ensure the implementation of global standards not examined in the empirical research.

13	Thirupathi et al. 2018	Springer	Application of system dynamics modelling for a sustainable manufacturing system of an Indian automotive component manufacturing organisation: a case study	Study is to build a system dynamics model to identify areas required for sustainable improvement in automotive component industries.	The research basic view is to help organizations efficiently evaluate and improve sustainability in automobile industries.	The proposed system dynamics is not taking important criteria.
14	Habidin et al. 2018	InternatIonal Journal of SuStaInable engIneerIng,	Critical success factors of sustainable manufacturing practices in Malaysian automotive industry	The purpose of this study is to scrutinize the critical success factors of sustainable manufacturing practices	In this research four factors of analysis as measurement for SMPs constructs demonstrated a good fit and proved that this was valid and reliable for Malaysian automotive industries.	This research only in Malaysian automotive industry.
15	Gupta et al. 2018	Emerald-insight	Implementation of sustainable manufacturing practices in Indian manufacturing companies	This research study reveals that the Indian manufacturing companies necessitate to work on cutback of raw materials and energy consumption, and expresses on waste treatment and waste discharge.	Finding of the research specify a importance relationship of sustainable manufacturing practices.	This study is to execute only few industry, carry in a variety of awareness to manufacturing sustainability
16	Stoycheva et al. 2018	Journal of Cleaner Production	Multi-criteria decision analysis framework for sustainable manufacturing in automotive industry	This research develop a quantitative framework for sustainable manufacturing and demonstrate its application for the automotive	This paper investigated the application of the conceptual framework to MCDA methods by comparing results of four different weighting perspectives.	The purpose of this study was not to provide a authoritative solution.

				industry.		
17	Mohamed Aboelmaged 2018	Journal of Cleaner Production	The drivers of sustainable manufacturing practices in Egyptian SMEs and their impact on competitive capabilities: A PLS-SEM model	This paper examines the impact of technological, organisational and environmental (TOE) drivers on sustainable manufacturing practices (SMP), and the influence of these practices on competitive capabilities (i.e., quality, cost, delivery and flexibility)	The findings demonstrate that environmental pressures from stakeholders, management support and the engagement of employees positively influences SMP	The work has inherent limits related to data collection and generalisation.
18	Cheraghalipour et al. 2018		A bi-objective sustainable supplier selection and order allocation considering quantity discounts under disruption risks: A case study in plastic industry	This paper focused on sustainable supplier selection.	In this paper, a decision-making tool is provided to solve the sustainable supplier selection and order allocation problem in a multi-period, multi-item, and multi-supplier environment considering quantity discounts and disruption risks.	In this research supplier selection criteria very industry to industry.
19	Goel et al. 2018	IEEE	Modelling Sustainable Manufacturing practices for plastic part manufacturing organization using Interpretive Structural Modeling	This research focus on development of environmentally friendlier process helps to move towards green image focus through development of sustainability	Interpretive Structural Modeling framework has been developed to critically analyze interrelationships and interactions among practices pertaining to the plastic part manufacturing process.	The driving factors may vary depending upon on the basic operation of an organization.

				reporting and enhanced corporate social responsibility.		
20	Cimatti et al. 2017	14th Global Conference on Sustainable Manufacturing, GCSM, Stellenbosch, South Africa	Eco Design and Sustainable Manufacturing in Fashion: a Case Study in the Luxury Personal Accessories Industry	The main aim of paper Life Cycle Assessment of a traditional product of the company is also to enhance the significant aspects of sustainability in Fashion	This study demonstrates that considering Fashion unsustainable is not the only possible interpretation. If we refer to the social dimension of sustainability, luxury brands production can have sustainable aspects, especially in regards to the slowness of production, encompassing the quality of work and life of the skilled employees who fabricate the product.	The issue of sustainability in Fashion, to which customers are becoming more and more sensitive, is highly relevant nowadays, research is required to better evaluate which aspects and methods can make Fashion production more sustainable.
21	Truong et al. 2017	Symmetry	The Fuzzy u-Chart for Sustainable Manufacturing in the Vietnam Textile Dyeing Industry	This research proposed fuzzy u-chart is implemented in the Vietnam textile dyeing industry to replace its conventional u-chart	In this study demonstrate that the industry can effectively evade unnecessary adjustments to its current processes; thus, the industry can substantially reduce its operational cost and potential loss.	In this research lack of data collection.
22	Nelly Oelze, 2017	sustainability	Sustainable Supply Chain Management Implementation– Enablers and Barriers in the Textile Industry	This research focused on developments in company approaches to sustainable supply chain management	The research found that intra-industry collaboration is essential to save resources, benefit from knowledge exchange on sustainability issues, and strengthen communication	In this research depth analysis not conducted.

				within that industry.	with certain suppliers.	
23	Abdul-Rashid et al. 2017	International Journal Of Precision Engineering And Manufacturing	Drivers for the Adoption of Sustainable Manufacturing Practices: A Malaysia Perspective	This research aims to provide an insight into drivers to the implementation of sustainable practices in developing nations, specifically in Malaysia	In this research outcomes is company/corporation/organization culture and public awareness are the main drivers of manufacturing companies adopting sustainable manufacturing in Malaysia	The data are specific for Malaysia manufacturing companies, which may differ from other developed countries.
24	Xia et al. 2017	Journal of Manufacturing Science and Engineering	Energy-Oriented Maintenance Decision-Making for Sustainable Manufacturing Based on Energy Saving Window	Energy-oriented maintenance framework can be applied not only in the automotive industry but also for a broader range of manufacturing domains such as the aerospace, semiconductor, and chemical industries.	This paper proposes an energy-oriented maintenance framework to handle a machining line in batch production.	The power rating as shown on nameplates may not be representative of actual power consumption.
25	Shukla et al. 2017	International Conference on Advances in Mechanical, Industrial, Automation and Management Systems (AMIAMS)	Evaluating key factors of sustainable manufacturing in Indian automobile industries using Analytic Hierarchy Process (AHP)	This research paper aim is presents an pragmatic study for evaluating the key factors of sustainable manufacturing in Indian automobile industries using Analytic Hierarchy Process.	This paper has evaluated key factors of sustainable manufacturing in automobile industries using AHP. The decision hierarchy was formed based on key factors of sustainable manufacturing. Then relative importance of factors i.e. factor weights were calculated through	In this study conducted smaller group of Automobile Industries, if conduct similar studies on a large scale may be key factor changed

					pair wise comparison matrix.	
26	Mwanza et al. 2017	14th Global Conference on Sustainable Manufacturing, Stellenbosch, South Africa	Major Obstacles to Sustainability in the Plastic Industry	This research paper identified the obstacles to sustainable recovery and recycling of plastic solid waste	In this research a survey was conducted on a number of plastic manufacturing companies in Kitwe city in Zambia to identify the major obstacles affecting sustainable PSW recovery and recycling.	This research limited to one country only.
27	Alay et al. 2016	Sustainable Chemistry and Pharmacy	A sample work on green manufacturing in textile industry	This research main objective is develop textile structures which have sustainable, environmentally friendly and functional characteristics	In this study outcomes is First, the materials should be composed of raw material which is environmentally friendly. Second, the harmful emissions of whole production processes should be limited. Third, the material can be easily disposed of with no detrimental effects on the environment after their use.	In this research test conducted on few selected green materials.
28	T. Stock and G. Seliger, 2016	13th Global Conference on Sustainable Manufacturing - Decoupling Growth from Resource Use	Opportunities of Sustainable Manufacturing in Industry 4.0	This paper will present a state of the art review of Industry 4.0 based on recent developments in research and practice.	A use case for the retrofitting of manufacturing equipment as a specific opportunity for sustainable manufacturing in Industry 4.0 will be outlined.	In this research paper only given the overview sustainable manufacturing.
29	Kyung Eun Lee, 2016	Sustainability in the Textile Industry, Springer	Environmental Sustainability in the Textile Industry	This research explains strategic approaches for promoting environmentally sustainable textile product	This study focused on promote environmental protection in the production and consumption of textile products	This research conducted only one country only.

				consumption and production in the textile industry.		
30	Bhanot et al. 2016	Journal of Cleaner Production	An integrated approach for analysing the enablers and barriers of sustainable manufacturing	This study aims to propose comprehensive sustainability framework for manufacturing domain to strengthen the enablers and mitigate barriers based on the responses of researchers, and industry professionals	The study has been statistically validated for enablers and barriers by employing structural equation modeling based on the responses of both the group	Enablers and barriers may very industry to industry.
31	Seth et al. 2016	Journal of Manufacturing Technology Management	An empirical investigation of critical success factors and performance measures for green manufacturing in cement industry	The main objective of this study is to establish and analyse the relationships between CSFs and PMs to support GM by developing a framework, for Indian cement industry	In this study contributes towards GM theory extension and enriches the theoretical base by offering empirical relationships linking both CSFs and PMs to examine the role of, top management, human resource management, organisational culture, green practices, process management, supply chain management from cement industry.	This study establishes the relationships but does not ensure that the variables chosen are optimized or not.
32	Alayón et al. 2016	Journal of Cleaner Production	Conceptual sustainable production principles in practice: Do they reflect what	This paper presents an view of how companies in different industries take out manufacturing	This paper has investigated whether conceptual sustainable production principles, represented by the LCSP principles reflect what	In this study lack of connecting conceptual sustainable production

			companies do?	practices related to the sustainability production principles.	companies do. The paper revealed that a number of the production principles are adhered to in current manufacturing practices.	principles and its implementation within different contexts of interest (e.g. specific industries, at the national or global scale)
33	Shen et al. 2015	Sustainability	Evaluation of Barriers of Corporate Social Responsibility Using an Analytical Hierarchy Process under a Fuzzy Environment—A Textile Case	This research mainly study on reveals the factors that are resisting the implementation of CSR in the textiles industry with the assistance of a proposed model, and this model is validated with a case industry situated in southern India.	This study evaluates the essential barrier of CSR implementation in Indian textile industries with the assistance of proposed framework	This study based on southern India only.
34	Bovea et al. (2014)	Journal of Cleaner Production	A holistic review of applied methodologies for assessing and selecting the optimal technological alternative from a sustainability perspective	The aim of the study was to examine and select the optimal technological alternatives (green technologies, remediation technologies, emission abatement technologies, etc.) from the available literature of the last 10 years	The major outcome of the study is that multi-criteria decision making (MCDM) methods are the most utilized optimal techniques for technology assessment and selection process.	Lack of assessment and selection process.
35	Cagno et al.	Production Planning &	Eco-efficiency for sustainable	The article is intended to	In this research quantify the	This research not focused on

	2014	Control	manufacturing: an extended environmental costing method	propose an environmental costing method to enable a proper analysis of the flows of products, by-products and wastes produced by a whole production plant or simply by a section of this plant, in order to properly prioritise a list of likely interventions and to make better decisions to head for higher level of eco-efficiency, hence sustainability.	loss of production capacity owed to the generation of industrial waste, and to analyse the efficiency in the use of production resources and means.	the classification of standard resource and activity drivers.
36	Hahn and Kühnen (2013)	Journal of Cleaner Production	Determinants of sustainability reporting: a review of results, trends, theory, and opportunities in an expanding field of research	To find out inconsistencies, gaps and future direction from the categorization of available literature for sustainability. The authors considered 178 articles in timespan of 1999e2001.	The outcomes of the article are as follows: (i) The sustainability in the triple bottom line approach is still in its early stage which indicates opportunities to carry out more studies. (ii) They also highlighted a lack of research on managerial attitudes and culture.	In this research barriers and enablers of textile industry not discussed.
37	Emrah Alkaya and Göksel	Journal of Cleaner Production	Sustainable textile production: a case study from a woven fabric	The aim of this research was to investigate the applicability of	The results of the study indicate that the wide-spread uptake of proposed sustainable production	This research study only one country.

	N. Demirer , 2013		manufacturing mill in Turkey	different sustainable production measures and demonstrate environmental and economical benefits in a woven fabric manufacturing mill in Bursa, Turkey.	measures would generate a tremendous change in the Turkish textile industry even without heavy investments for technology changes.	
38	Singh et al. 2013	Clean Techn Environ Policy (Springer)	Fuzzy-based sustainable manufacturing assessment model for SMEs	This study proposes a fuzzy implication system-based model for the evaluation of manufacturing sustainability of small and medium enterprises.	In this research SMEs to measure their sustainability efforts and to categorize the weak areas, which require more attention. Based on the evaluation, decision makers can get better their decisions about future performance required to enhance the largely sustainability of their organization	In real situation, each indicator has diverse weight depending on the in particular objective of SME, and that may not be relative
39	Isaac Twum Asare, 2012	International Journal of Business and Social Science	Critical Success Factors For The Revival Of The Textile Sector In Ghana	This Research works main objective is to the Ghana Textile Industry were reviewed and based on their findings.	This research outcomes are outlines four main critical success factors (management, government support, marketing, collaboration with local dress makers/fashion designer) as very vital to reviving this industry.	This research done one country only.
40	Ball et al. (2012)	Production Planning & Control	The emergence sustainable manufacturing practices	The aim of this article is to highlight and investigate the	The outcomes of the article are as follows: (i) It reported that most of	Lack of survey data and generalization.

				various sustainable manufacturing activities through cases reported in the available literature. The authors considered 83 articles in a timespan of 2000e2010.	the studies carried out in the field of sustainable manufacturing are based on the theoretical concepts and need to develop framework for effective adoption of the concept. It also highlighted the requirement of proper documentation of sustainable manufacturing practices. It also explored that in most of the studies only environment and economic aspects are considered and less evidence of social aspect is present which can be possible future direction of research.	
41	Marco Garetti and Marco Taisch, 2012	Production Planning & Control: The Management of Operations Publisher: (Taylor & Francis)	Sustainable manufacturing: trends and research challenges	Main bjective of the research is technology, on which the manufacturing is largely based, is asked, together with culture and economy, to give the tools and options for building new solutions towards	Factors can reflect the availability of new technology, the enactment of a new law, as well as, the depletion of resources or accumulation of undesirable products.	Introduction of a new technology can change the definition of what is sustainable.

				a sustainable manufacturing concept.		
42	Joung et al. 2012	Ecological Indicators, Elsevier	Categorization of indicators for sustainable manufacturing	This paper presents a categorization of sustainability indicators, based on mutual similarity, in five dimensions of sustainability: environmental stewardship, economic growth, social well-being, technological advancement, and performance management.	This research paper explains how to use this indicator set to assess a company's manufacturing operations.	Industry to industry very categorization of indicators for sustainable manufacturing
43	Subic et al. 2012	sustainability	Capability Framework for Sustainable Manufacturing of Sports Apparel and Footwear	This research paper focused on the development of relevant capabilities across their supply chain for sustainable manufacturing of sports apparel and footwear.	The article presents the developed sustainable manufacturing framework and capability assessment results obtained for selected companies within the supply chain of this global manufacturer in Asia.	This research conducted in Southeast Asia only.
44	Baskaran et al. 2012	International Journal Production Economics	Indian textile suppliers' sustainability evaluation using the grey approach	This paper evaluates suppliers' within the Indian textile and clothing industry using sustainability criteria.	The results indicate that the criterion of long working hours is a critical one for both categories of suppliers; in the case of garment manufacturers, we found that pollution and unfair competition were the most	In this research few supplier evaluation criteria has been taken.

					important criteria. In addition, employing child labor was found to be a critical criterion in the case of ancillary suppliers.	
45	Kirsi Niinimäki and Lotta Hassi, 2011	Journal of Cleaner Production	Emerging design strategies in sustainable production and consumption of textiles and clothing	The paper focus on ways to rethink and redesign business in the textile and clothing field by offering an overview on several design strategies that exist today in niche markets	This paper presented a set of design and manufacturing strategies for the textile and clothing industry that could reduce the environmental impact of textile and clothing production and consumption.	In this research paper presented strategies will not directly lead to sustainable practices, as the system is not yet ready for radical change.
46	Amrina et al. 2011	IEEE	Key Performance Indicators for Sustainable manufacturing Evaluation in Automotive Companies	This paper proposes a set of preliminary key performance indicators for sustainable manufacturing evaluation set to be appropriate to automotive ompanies, consisting of three factors divided into nine dimensions and a total of 41 sub-dimensions.	This study tries to combine sustainability with manufacturing performance and has built-in them into sustainable manufacturing indicators. As a result, a set of preliminary KPIs for sustainable manufacturing evaluation in automotive companies was proposed.	This research lack of focused on an evaluation tool to weigh up sustainable manufacturing performance in automotive companies.
47	Haapala et al. (2011, 2013)	Proceedings of the ASME 2011 International Manufacturing	A Review of Engineering Research In Sustainable Manufacturing	The article aims to highlight the various concepts, methods, and tools of Sustainable Manufacturing at a	The authors highlighted the following insights: (i) There are opportunities for technology and enriched knowledge with	In this research only discussed new technology adoption.

		Science and Engineering Conference		system level and compare to process development and analysis of discrete manufacturing.	respect to manufacturing processes and equipment. (ii) There exist an opportunity for process development in terms of material recovery and re-utilization. (iii) In manufacturing systems, there are opportunities for reducing resource consumption, waste production and negative environmental impacts through continuous improvement methods.	
48	Arena et al. (2009)	International Journal of Product Lifecycle Management	A state-of-the-art of industrial sustainability: definitions, tools, and metrics	The objectives of the present study are: (i) Explore detail concept of sustainability (ii) Identifying the ways to achieve and measure the sustainability of products & processes (iii) Finding ways to improve sustainability	The outcomes of the paper are: i. Sub-dimensions of sustainability are partially influenced by context variables. ii. For smooth implementation of sustainability strategies, different tools are required to be adopted for different organizations. iii. The adoption of the measurement system depends on the type of industry and corporate functions.	In this research measurement of system depend on industry to industry.
49	Rashid et al. (2008)	International Journal of Sustainable Engineering	A comparison of four sustainable manufacturing strategies	The article aims to identify most adopted ustainable manufacturing strategies for improving material	The outcomes of the paper are: i. Material efficiency was the most significant characteristics of each strategy of SM. ii. To avail the opportunities of reducing	In this research lack of data collection and generalization.

				performance and to compare these strategies against 17 different characteristics of SM strategies.	energy consumption, a dual approach of material efficiency together with energy efficiency can be considered.	
50	Glavic and Lukman (2007)	Journal of Cleaner Production	Review of sustainability terms and their dentitions	The paper aims to clarify the vagueness of 51 sustainability terms with hierarchical classification of the terms in the environmental engineering field	The outcomes of the paper are: (i) Depending upon the similarities and differences of the terms, their relationships among each other were established. (ii) There are interconnections between environmental protection, economic performance and societal welfare which are required to be understood	In this research lack of awareness on textile industry obstacles.

Table 2- Sustainable Manufacturing enablers, barriers, obstacles, and critical success factor

S. N	Sustainable Manufacturing enablers, barriers, obstacles and Critical success factor		Sourses
1.	Enablers	Availability of information	Bechtel et al., 2013; Ghazilla et al., 2015; Lieder and Rashid, 2016; Macarthur, 2013; Siemieniuch et al., 2015; Mutingi, 2013;
		Employee involvement/ motivation	Wu et al., 2010; Bechtel et al., 2013; Mudgal et al., 2009; van Raaij et al., 2008; Macarthur, 2013 ; Diabat and Govindan, 2011;
		Knowledge sharing in supply chain	Bechtel et al., 2013; Ghazilla et al., 2015; Lieder and Rashid, 2016; Macarthur, 2013
		Interests about ecological effects and the situation of the	Bechtel et al., 2013; Ghazilla et al., 2015; Lieder and Rashid,

		environment	2016; Macarthur, 2013
		Collaboration among organizations	Wu et al., 2010; Bechtel et al., 2013; Mudgal et al., 2009; Mutingi, 2013
		Competitive advantage	Wu et al., 2010; Bechtel et al., 2013
		Economic benefit	Bechtel et al., 2013; Diabat and Govindan, 2011; Ghazilla et al., 2015
		Environmental collaboration with customer	Wu et al., 2010; Bechtel et al., 2013; Mudgal et al., 2009; Mutingi, 2013; van Raaij et al., 2008
		Worldwide environment stress and environmental shortage of properties	van Raaij et al., 2008; Siemieniuch et al., 2015
		Community pressure	Bechtel et al., 2013; Hanna et al., 2000; Walker et al., 2008
		Customer awareness to green initiatives	Mudgal et al., 2009; Bhool and Narwal, 2003;
		Funding from government	Walker et al., 2008; Hanna et al., 2000
		Reusing and recycling materials and packaging	Bechtel et al., 2013; Bhool and Narwal, 2003;
		ISO 14001 certification	Bechtel et al., 2013; Tay et al., 2015
		Environmental collaboration with suppliers	Nordin et al., 2014; Mudgal et al., 2009
		Reduced air emissions	Azapagic and Perdan, 2000; Krajnc and Glavic, 2003
		Reduced waste water	Jash, 2000; Matos and Hall, 2007
		Reduced solid wastes	Parisi et al., 2015; DeBenedetto and Klemes, 2009;
		Decreased consumption of hazardous/harmful/toxic materials	Warhurst, 2002; Gauthier, 2005; Parisi et al., 2015; DeBenedetto and Klemes, 2009
		Decreased frequency of environmental accidents	Parisi et al., 2015; DeBenedetto and Klemes, 2009; Darnall et al., 2006
		Improvement in company's environmental situation	Darnall et al., 2006; Jash, 2000; Michelsen et al., 2006

		Reduced expense of materials merchandising	GRI, 2007; Krajnc and Glavic, 2003;
		Reduced expense of energy Utilization	GRI, 2007; SCC, 2008; Matos and Hall, 2007
2.	Barriers	Company policies	Dibenedetto, 2007; Zhou et al., 2007; de Brito et al., 2002
		Lack of appropriate performance metrics	Rogers and Tibben-Lembke, 2001; Ma et al., 2017
		Lack of training and education	Orsato, 2006; Zhou et al., 2007; Lau and Wang, 2009
		Lack of strategic planning	Gold et al., 2010; Barnes et al., 2006; Paras et al., 2018
		Lack of training and education	Dibenedetto, 2007; Jack et al., 2010
		Lack of financial support	Orsato, 2006; Min and Galle, 2001; Freise and Seuring, 2015; Jack et al., 2010; Paras et al., 2018; Lewis et al., 2017; de Brito et al., 2002
		Lack of working capital	Dibenedetto, 2007;; Paras et al., 2018; Lewis et al., 2017; de Brito et al., 2002; Ma et al., 2017
		Lack of information and technological systems	Desore and Narula, 2018; Hur and Cassidy, 2019; Limet al., 2017; Sandin and Peters, 2018; Rogers and Tibben-Lembke, 2002; Dibenedetto, 2007
		Unwillingness of suppliers, distributers, and sellers to provide support	Paras et al., 2018; Lewis et al., 2017; de Brito et al., 2002; Dangelico et al., 2013
		Lack of systematic regulation	Sivaprakasam et al., 2015; Ma et al., 2017
		Lack of enforcement laws	Chowdury and Hossain, 2015; Perry, 2015; Hyder et al., 2017
3.	Obstacles	Shortage of man power	Sethi, 2018
		When employer get trained they leave and go elsewhere that's why we are not interest in giving training to them	Sethi, 2018
		Workers give more preferences to earn money	Sethi, 2018
		No guarantee of ROI (return of investment)	Sethi, 2018

		Workers are not interested for trainings	Sethi, 2018
		High cost of Training	Sethi, 2018
		Lack of resources	Sethi, 2018
		Lack of proper training facilities	Sethi, 2018
		Workers do not consider trainings useful	Sethi, 2018
		Lack of good trainers	Sethi, 2018
		Lack of funds	Sethi, 2018
		Impossible to stop production	Sethi, 2018
		It's waste of time	Sethi, 2018
		No apparent benefits of training	Sethi, 2018
5.	Critical success factor	Management	Asare, 2012
		Government support	Asare, 2012
		Marketing	Asare, 2012
		Collaboration with local dress makers/fashion designer	Asare, 2012

2.2 Rationale of Study

In the current era industries are facing stiff competition because of new technologies and customers' demand and other textile industry competitions them. As a result of competition, manufacturing industries are using new drivers or indicators to improve their performance. In this radiance it is important to know how these industries are performing comparing to others, whether they are creating value or not. These industries are efficient or not in Indian perspective and what is the present situation of productivity growth as well as financial and social image? So, the present day requires the metrics, which can judge or measure manufacturing industries efficiency and achieve the industrial strategic goals. One important observation from the literature is that there is lack of study to understand the implementation sustainable manufacturing in textile industry. . It also highlights the importance of sustainable manufacturing. One of the tedious tasks in the present scenario is determination of all the potential benefits of sustainable manufacturing implementations. These benefits are not derived from the sustainable manufacturing itself but from the numerous solutions that arise from sustainable manufacturing implementations. Integration of sustainable manufacturing can provide various benefits to textile industry, which are addressed throughout in the research.

There were several research questions arises from the literature review which are as follows-

- The various factors (enablers, barriers, CSFs etc.) of SM implementation are of automotive industries. There is a lack of various factor of SM of textile industries. The SM implementation factor for textile industries may be similar or different.

- Most of researches conducted by the researchers on SM were theoretical based i.e qualitative research is done. The research is limited for SM in conducting quantitative analysis. There is lack of data collection to proper and develop a concrete framework of SM implementation in textile industries.
- There is a lack of comparative analysis of SM implementation amongst by various textile industries. A comparative analysis need to be done to ensure the effectiveness of SM implementation.
- The research of SM lack in assessing the new technology being adopted in succefully implementation of SM in textile industries.
- None of the study has develop a strategic framework for SM, which can be adopted the industries.
- Most of studies identified the obstacles of SM implementation but the research lack in developing framework and proposing the solution to overcome those obstacles.`

2.3 Gap identified from review of literature:-

In the extensive literature review observed that textile industries in the manufacturing sector which lack to adopt sustainable manufacturing. The textile industry is having high potentials to satisfy the customers need, social aspects and it also provides threats to environmental aspects. With such potentials and threats, the number of studies recorded in textile industries can be considered to be inadequate. Initiate extensive studies in textile industries to identify the better ways for sustainable manufacturing adoption.

According to the literature review results and the proposed conceptual model, we identified research gaps, which include the lack of social factors in sustainable measurements and diversity of research methodology and ignore industrial obstacles in sustainable manufacturing and also it was clear that technological innovation is an important enabler in applying sustainable manufacturing.

I have reviewed a many of research papers in which I have observe that most of research papers available on sustainable manufacturing in the automobile industry, cement industry, food industry, and plastic industry, but there is limited research paper available on the textile industry and it is found that very few research work on barriers, enablers, and obstacles in the textile industry and also sustainable manufacturing in the textile industry. This needs to be further investigation to fulfil the research gap especially Indian textile industries.

3. Objectives of the Study

- To develop a framework and understand the effect of sustainable manufacturing adoption in Indian textile industries.
- To check similarities and dissimilarities of technological adoption of sustainable manufacturing.
- To identify and rank sustainable manufacturing enablement practices being adopted by Indian textile industries.
- To identify and prioritize the various obstacles and their solution of sustainable manufacturing implementation.
- To identify the various critical success factors of sustainable manufacturing implementation.
- To identify and prioritizing the various performance outcomes of sustainable manufacturing in Indian textile industries.

4. Research Methodology

To accomplish the objective (s), we planned to conduct a survey of Indian textile industries in order to get their feedbacks on factors that identify and prioritizing the various performance outcomes of sustainable manufacturing in Indian textile industries.

The research will be conducted in the following different phases -

4.1 Research Design

Stage 1: ***Exploratory Research:*** It includes the collection, combination and integration of non–numerical data.

Stage 2: ***Descriptive Research:*** The factors identified for textile industry will be used to measure the performance.

Stage 3: Hypothesis testing will be done with the help of Structural Equation Modeling.

4.2 Sample Design

Our sample size consists of textile Industries in India.

4.3 Data Collection

- Prepared questionnaire will be pilot tested on leading practitioners and academicians. Based on their feedback the final version of the questionnaire will be prepared.
- Data is to be collected through a postal survey, personal interviews and through e-mails to the managerial level personnel of the company.

4.4 Research Data Analysis Tools to be used

After receipt of responses data would be entered into statistical package for further analysis. The following are the brief summary of the quantitative tools that may be used for research problem depending upon the nature and objective of the manufacturing firm to be studied.

- *Structure Equation Modeling (SEM)* will be used for hypothesis testing.
- *Interpretive Structural Modeling (ISM)* will be used for Sustainable manufacturing Enablers and Barriers.
- Data Envelopment Analysis (DEA) will be used to evaluate and assess the efficiency scores of Indian textile industries.

- Based on the study an implementation framework for Sustainable manufacturing performance measurement is to be developed to suit the industries.

4.5 Multi-criteria decision making (MCDM) methods

Various MCDM methods such as AHP, DEMATEL, TOPSIS, VIKOR, ARAS, etc. will be used for fulfilling the objectives of the research. The making the pair-wise comparison various experts of the field will be contacted and their suggestions and recommended will be taken.

4.6 Software to be used

Various software used for data analysis such as SPSS, MATLAB, AMOS and R language.

4.7 Methodology adopted in the research (tentative)

Table 3 Methodology adopted in the research (tentative)

	S.no.	Objective of the Research	Methodology adopted	Empirical case study	
Sustainable manufacturing literature review	1	To develop a framework and understand the effect of sustainable manufacturing adoption in Indian textile industries.	Expert opinion + Questionnaire survey	Pilot study	Research Conclusion
	2	To check similarities and dissimilarities of technological adoption of rank sustainable manufacturing.	Survey	Case study	
	3	To identify and rank sustainable manufacturing enablement practices being adopted by Indian textile industries.	AHP	Case study + Survey	
	4	To identify and prioritize the various obstacles and their solution of sustainable manufacturing implementation.	Hybrid Fuzzy DEMATEL	Case study	
	5	To identify the various critical success factors of sustainable manufacturing implementation.	TOPSIS	Case study + Survey	
	6	To identify and prioritizing the various performance outcomes of sustainable manufacturing in Indian textile industries.	Fuzzy BSC + TOPSIS	Comparative analysis	

5. Proposed Research Plan

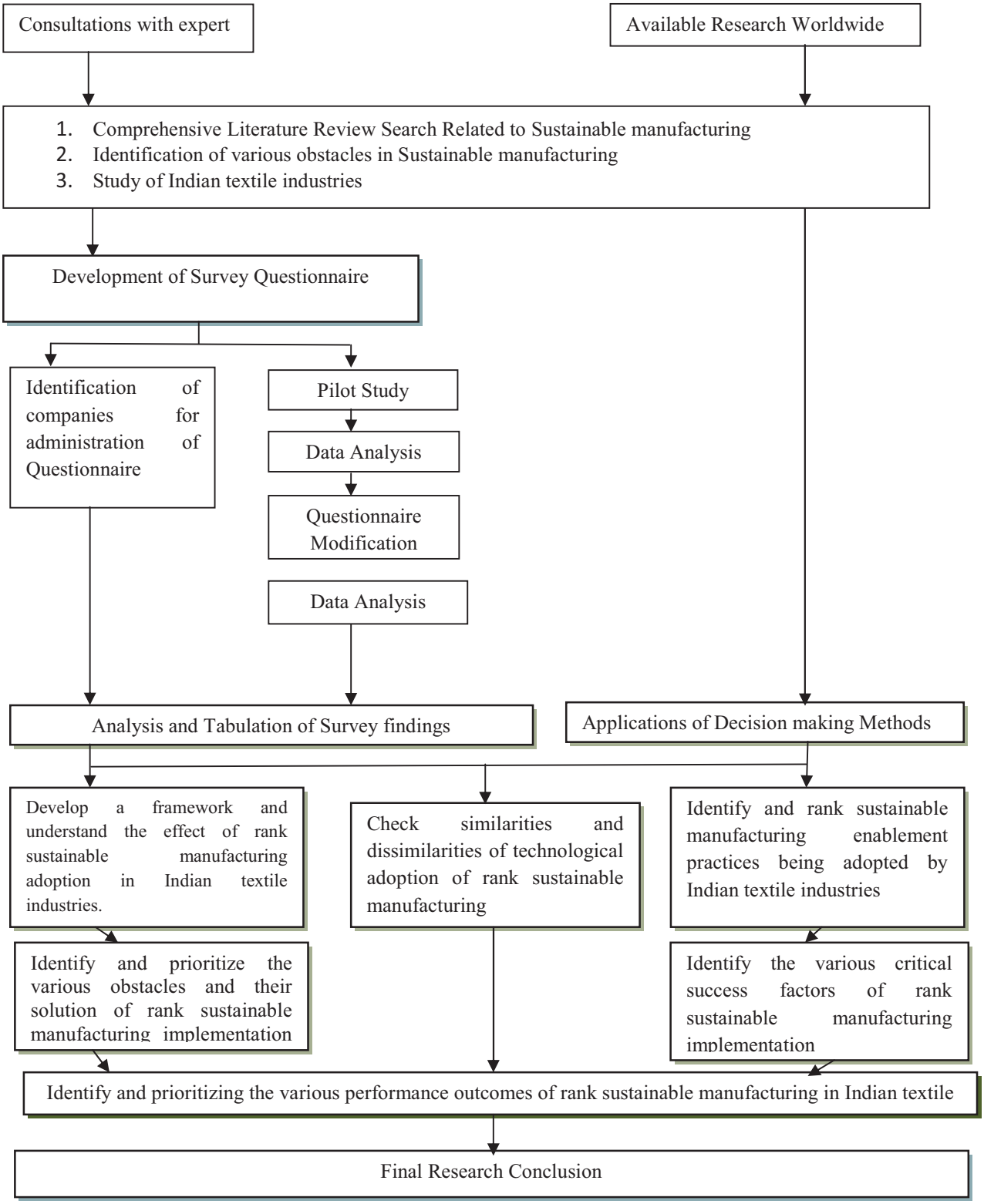
Consultations with expert
Available Research Worldwide
1. Comprehensive Literature Review Search Related to Sustainable manufacturing
2. Identification of various obstacles in Sustainable manufacturing
3. Study of Indian textile industries
Development of Survey Questionnaire
Identification of companies for administration of Questionnaire
Pilot Study
Data Analysis
Questionnaire Modification
Data Analysis
Analysis and Tabulation of Survey findings
Applications of Decision making Methods
Develop a framework and understand the effect of rank sustainable manufacturing adoption in Indian textile industries.
Check similarities and dissimilarities of technological adoption of rank sustainable manufacturing
Identify and rank sustainable manufacturing enablement practices being adopted by Indian textile industries
Identify and prioritize the various obstacles and their solution of rank sustainable manufacturing implementation
Identify the various critical success factors of rank sustainable manufacturing implementation
Identify and prioritizing the various performance outcomes of rank sustainable manufacturing in Indian textile
Final Research Conclusion

Figure 1 – Research Plan

6. Conclusion

This study deals with the sustainable manufacturing in Indian textile industry, an area of enormous concern. The results of this research will be aimed at responding to the questions such as what is the current status of the sustainable manufacturing in the Indian textile industry, finding the current status of sustainable manufacturing and implementation of sustainable manufacturing in textile industry, its benefits and limitations as well as the one that will develop the future sustainable manufacturing aspects, and also like the present significance of sustainable manufacturing.

A framework will be develop to prepare questionnaire on sustainable manufactruing adoption and survey will be conducted for Indian textile industries. The survey result will be analyzed using SPSS. Various MCDM method will be used to analyze the factors of sustainable manufacturing adoption such as critical success factor, practices various and performance outcomes. In this research various case studies also we conducted of an Indian textile industry.

Research Schedule

Activity	**Time Period**	**Months**
Date of Registration	21st April 2019	-
Course Work		
Comprehensive Written Examination		
Comprehensive Oral Examination/Research Proposal Viva-voce		
Data Collection		
Data Analysis		
Results and Discussions		
Conclusion and Thesis Submission		